

CLAIMS

1. An imaging and catheter steering assembly comprising a magnetic field generating assembly operable in a first mode
5 to generate a first magnetic field in a working volume located outside the assembly, the first magnetic field being suitable for use in a catheter steering procedure, and in a second mode to generate a second, static magnetic field in the working volume suitable for conducting a
10 magnetic resonance imaging process (MRI), the second magnetic field being more uniform in the working volume than the first magnetic field; and a catheter having a magnetic seed attached whose orientation, and hence the steering direction of the catheter, is determined by
15 interaction with the first magnetic field.
2. An assembly according to claim 1, wherein the magnetic field generating assembly comprises first and second electromagnets whose currents may be adjusted or reversed within a working range including zero, so as to vary the
20 magnitude of the Z direction component of a vector rotate magnetic field in the working region as required in the steering procedure of the first mode, and may also be adjusted to a fixed setting which, in combination with the first and second electromagnet's coil positions and turns
25 densities, generates a relatively uniform magnetic field in the working region as required in the imaging procedure of the second mode.
3. An assembly according to claim 2, further comprising third and fourth magnets for generating pulsed magnetic
30 fields with linear gradients in mutually orthogonal X and Y directions respectively, orthogonal to the Z direction, during the MR process and substantially static magnetic fields in the X and Y directions respectively during the steering procedure.
- 35 4. An assembly according to claim 2 or claim 3, wherein one or more of the magnets are superconducting electromagnets.

5. An assembly according to claim 4, wherein the coils are made from high temperature superconductor.

6. An assembly according to any of claims 2 to 5, wherein the first and second magnets comprise electrical coils, the
5 coil positions and turns densities being such that the coils exhibit substantially zero mutual inductance.

7. An assembly according to any of the preceding claims, wherein the magnetic dipole of the magnetic seed in the catheter tip may be switched on in steering mode and off in
10 imaging mode.

8. An assembly according to claim 7, wherein the magnetic seed comprises a semi-hard permanent magnet whose magnetisation may be switched on by applying a pulse of current to a microcoil wound around the seed, and switched
15 off by applying a decaying oscillating pulse of current to the same microcoil.

9. A method of carrying out a medical procedure, the method comprising providing apparatus according to any of the preceding claims; inserting the catheter into a body; steering the catheter through the body by selectively
20 operating the assembly in the first mode; and obtaining an image of part of the body by operating the assembly in the second, imaging mode.